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ABSTRACT

This review of research on Asian American performance on cognitive measures (especially in comparison with the performance of whites) covers studies of intelligence test performance, academic ability, aptitude and achievement, cognitive style, and career paths (as influenced by cognitive abilities) among young children, elementary and secondary school students, applicants for admission to higher education, and college and graduate students since 1960. The review reveals that on intelligence and aptitude tests, Asian Americans have consistently scored higher in mathematics and lower in verbal sections than the United States population as a whole. Studies of cognitive style suggest that Asian Americans lean toward field independence and tend to do better in cognitive analysis and restructuring tasks than in activities that require greater social sensitivity. Examination of career paths indicates that Asian Americans are overrepresented in higher education institutions and in academic fields that require aptitudes for mathematics, spatial conceptualization, and reasoning, but are underrepresented in humanities and the social sciences. The review is said to demonstrate that widely-used, standardized individual and group assessment instruments have provided valid, consistent, and educationally useful information about the mental abilities of Asian Americans. Future directions in assessing academic potential and evaluating achievement among bilingual and limited-English-speaking students are presented. (Author/MJL)

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COGNITIVE ASSESSMENT OF ASIAN AMERICANS

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COGNITIVE ASSESSMENT OF ASIAN AMERICANS

Jayjia Hsia

There has not been a great deal of research in the area of Asian American performance on cognitive measures. This paucity of information might be attributed to any number of reasons. From a numerical point of view, the population of Asian Americans and Pacific Islanders of all ethnic origins has not been large enough to warrant the scale of support needed for scientific investigation. However, an ERIC search yielded scores of studies on decimated Native American tribal children and cross cultural studies of tiny nonliterate tribes in Africa and the Antipodes for every study on Asian Americans or Asians. So it would be difficult to build a case on population size alone.

It is also possible that Asian Americans, who appear to be upwardly mobile, do not constitute adequate social, psychological or educational challenges to interest social scientists. There is abundant research on American and Israeli Jews, however, who have manifested accelerated rates of upward social mobility, so that social mobility alone cannot represent justification for exclusion from scholarly investigation. Another hypothesis could be that Asian Americans as a group have been leery of any invasion of privacy, and have rejected participation in research studies. Yet, acculturated Asian Americans ought not to prove more shy than isolated Native American or Hispanic barrio groups, who have been extensively studied.

There is evidence that Asian Americans themselves do not enter fields of study which lead to the accumulation of research literature about their own ethnic group psychology or psychometric performance. Yee (1974) has deplored the minute proportion of Asian Americans who choose to undertake research in education, psychology and sociology; and the Sue brothers (1975) confirmed the limited membership and power of the Association of Asian-American Psychologists. We must remind ourselves, however, that all research on Hispanic Americans has not been done by Chicanos or members of the Puerto Rican and Cuban communities,

nor have most of the studies on Native Americans been undertaken by members of the American Indian nations.

This conference is a most welcome occasion, since it has supplied the impetus to mobilize Asian American social scientists and educators to think about the particular attributes of their own peoples, who have, to date, been rather neglected by researchers.

Quality, Relevance and Interpretability of Available Data

Current interest focuses upon the concerns of bilingual students. Historic data about Asians, Pacific Islanders and Asian Americans collected during the first half of the twentieth century have limited meaning for addressing contemporary educational issues. Therefore, only data collected since 1960 have been included in this review.

Available research reports generally fall into four categories: First, there have been the national educational surveys, with strong designs and the resources for collecting reliable data from a random sample of the U.S. student population. Data on Asian Americans (sometimes labeled Orientals) are collected incidentally to information on larger minority groups. Since the proportion of Asian Americans to any given total student population is generally small, the numbers sampled are usually equally small. Thus, if subgroups were ever even to be considered, the numbers of empty cells would preclude reported findings by subgroups. There would also not have been anchoring data, since only 1980 census will provide information about subgroup membership among several Asian American and Pacific Islander groups. Examples of large scale surveys include the Coleman study (1966), and Project Talent (Backman, 1972).

Second, there are a number of well-designed, statistically and/or physically controlled studies of particular ethnic groups within the Asian American category, or of Asian American individuals. These

studies are on a smaller scale, and have been limited to a specific region, state or community(s). Among studies in this category would be the study on young Chinese children by Lesser and his associates (1975) and on Oriental high school students in Project Access (Flaugher et al., 1971, 1972).

There are also collections of reliable and valid achievement and aptitude data. Unfortunately, because the participants were self-selected, and reported group membership themselves, summary data about these groups cannot be regarded as representative information on the sub-populations as a whole. Examples of data in this category include summary statistics from national assessment programs such as the Graduate Record Examination, Law School Admissions Tests, Medical Colleges Aptitude Tests, and Scholastic Aptitude Tests. Information about each candidate group can be assumed to be reliable and valid only for that candidate group.

Finally, there are many small scale field studies on particular groups of Asian Americans or Pacific Islanders in school settings. Elegance of design was seldom a prime consideration, but findings were frequently provocative. The weight of evidence from such studies is enhanced where replications confirm original findings, or when several similar studies result in conclusions pointing in a single direction, or if the conclusions are confirmed by other studies falling under the first three categories. This review will, therefore, refer to studies of varying sizes and quality, but draw inferences only where the cumulative body of information so warrants.

Finally, a note is needed on the notion of measurement bias, and the reliability and validity of standard cognitive measures for assessing Asian Americans in general, and bilingual Asian Americans (especially less English proficient subjects) in particular. Much has been written about the inherent biases of cognitive measures, based upon mainstream cultural values, for the assessment of minority performance

(Gross & Su, 1974). But test bias research has really not been undertaken among Asian Americans:

> probably because overall they have shown little consistent or appreciable differences from majority Whites in scores on most standardized tests. This of course does not necessarily mean that tests are unbiased for Asian Americans, but only that tests have not been an important concern to this minority group (Jensen, 1980).

It will, therefore, be worthwhile to look at the reliability and validity coefficients for Asian Americans for the major studies reviewed.

In general, reliabilities of test batteries and even subtests reported for Asian Americans seem to be within acceptable ranges. In addition, this exercise in amassing available information about the cognitive performance of various ethnic, age, and educational groupings of Asian Americans, using a variety of instruments and study designs, will permit an approximation of the multi-trait, multi-method approach to construct validity. Statistical details, reliability and validity coefficients will also be discussed.

Unless otherwise noted, the present review will include only comparative data between Asian American groups and White students. To begin with, the studies used different minority groups for comparison purposes, and consistent across-studies comparisons are not possible. Furthermore, it is not the intent of this review to make invidious comparisons among various minority groups. Therefore such comparisons will be cited only if a particular educational or measurement purpose can be served.

Asian American Performance on Tests of General Intellectual Functions

"Intelligence Tests," as they are popularly called, are widely used as screening tools, and validated against broad academic and job performance criteria. There is usually a heavy verbal component to

tests that measure Spearman's g factor. There are, however, "nonverbal" or performance tests, that in fact do require substantial verbal mediation. These are generally considered more appropriate for young, unschooled, less English proficient (LEP) children. Once in school, however, verbal tests are generally reliable for predicting future academic performance.

Performance of young Asian Americans: The Figure Copying Test is an accepted developmental scale of mental ability which requires no verbal production on the part of young subjects. It is made up of ten geometric forms which a child is asked to copy. In a study in 21 California school districts, about 10,000 children of four ethnic groups from kindergarten through fourth grade were classified and ranked according to a social economic status (SES) composite index and tested by Jensen (1973). There was a consistent increment in average performance for all groups from K through 4. However, the Oriental childen (whom we assume to have been mostly Asian Americans) manifest the highest mean scores at each grade level. Orientals were ranked second in terms of SES, while White urban pupils ranked first. On the average, third grade Oriental pupils performed slightly better than top SES ranked fourth grade White pupils. The author confirmed these findings by writing:

> We have a large battery of tests on more than 1,000 Berkeley school children who are Japanese and Chinese, about half of whom are fairly recent immigrants from Hong Kong or Taiwan. I find that all of these groups are well above California norms on the nonverbal tests and the American-born are above the norms even on the verbal tests and on tests of scholastic achievement . . .. Immigrants, especially those who have been in the U.S.A. fewer than three years, are another matter, at least with respect to verbal tests (Jensen, 1975).

WISC performance scores of San Francisco Chinatown 4th graders yielded mean IQs of 98.6, 110.7, and 104.8 for Verbal, Performance, and Total Scores (Yee, 1974). Mental ages were found consistently higher than

chronological ages among young Vietnamese refugee children using Goodenough's human figure drawing test (Delatte, 1978).

Jean Piaget's methode clinique is an independent approach to cognitive assessment. Tuddenham (1978) adapted a number of Piaget's tasks for assessing the development of grade 1-4 pupils in the California bay area. Oriental pupil performance was found to be superior to that of White pupils on at least half of the items.

Yet another approach has been that of Jensen and his colleagues. They differentiate mental abilities into two levels: Level I (memory) and Level II (general intelligence). Among grade 2 to 6 children in a California school district, and among USC Beginning Psychology and Child Development students, Asian Americans achieved average scores lower than Whites in Level I tests, and consistent but nonsignificantly higher scores than Whites in Level II tests (Jensen & Inouye, 1980; Longstreth, 1978). Asian Americans are apparently less successful in rote memory tasks requiring little mediation or restructuring of information. This finding is the mirror image of findings reported in the cognitive style section of this review, where Asians and Asian Americans excelled at restructuring tasks.

Academic ability and achievement in school: A large-scale survey of school ability and achievement among pupils in grades 1, 3, 6, 9, and 12 was reported by Coleman and his associates in 1966. Their study confirmed relatively stronger performance by Oriental American (OA) pupils on nonverbal relative to verbal scales. The most able subgroup studied, Northeast Urban Whites (NUW) obtained mean verbal ability scores slightly higher than OAs. Beyond grade 6, OAs' verbal ability was higher than that of Southern Rural Whites (SRW). OAs overlapped and crossed NUW group means and was consistently above SRW means in the nonverbal ability scales (Coleman, 1966).

There is a substantial body of empirical evidence linking SES with academic ability. The Coleman study, however, showed a particularly strong relationship between SES indicators and the nonverbal ability measure among Oriental Americans. Table 1 shows correlation coefficients of grade 6 White and OA pupils with SES indicators.

Table 1

Correlations of 6th grade nonverbal ability scores with 4 SES indicators

Variable	White	Oriental American
Reading materials in home	.21	.45
Consumer items in home	.26	.51
Parents' education	.21	.19
Few Siblings	.06	.32

Source: Coleman, J. S., 1966.

This observed relationship may have implications for the newly arrived, and/or economically disadvantaged bilingual elementary school student. In addition to the expected verbal deficits, nonverbal performance can also be associated with specific environmental deprivation factors. Reanalysis by Boardman and others (1978) of the Coleman data showed that for Asian American 12th graders, SES had no direct effect on achievement.

Studies indicate that the effect of bilingualism upon school achievement is not invariant. Grade 6 bilingual Chinese and Japanese speaking children in California schools in 1977-78 achieved substantially higher basic skills scores than average. Their scores tended to be higher than those achieved by higher than White children when they were fluent in English and considerably lower than the referent groups in reading when they had limited English. Even limited

English bilingual Chinese and Japanese children scored above average in mathematics. The data does not permit inferences to be drawn with regard to their respective social economic status, but we can speculate that there is a socioeconomic interaction in addition to the limited English factor operating upon achievement levels (California Assessment Program, 1978[1]). Differential second language performance has also been shown to be related to fluency in the first language and SES among Canadians (Lambert, 1972).

Disadvantaged Asian American high school students who submitted ACT scores for college admissions did less well than White candidates from families in the same economic circumstances. The average standard composite scores of Oriental Americans during 1971-72 was 16.5, while that of their caucasian counterparts (family incomes under $7,500) was 20.3 This difference represents approximately two-thirds of a standard deviation. High school grade point averages between disadvantaged Asians and their White counterparts also differed. Oriental Americans averaged 2.5, while caucasians averaged 2.7 (American College Testing Program, 1972).

The cumulative trend manifest by empirical data on Asian American intellectual functions has been analyzed in the Ethnic Minorities Research Project of the Urban Institute. In the beginning of this century, IQ patterns of Chinese and Japanese children were found to be lower than average, though they did outperform native White children on specific subtests. Median IQs for Asian American samples have been reported since the '30s, as shown in Table 2. While sample sizes reported here are not impressive, and there is no information about the representativeness of the samples cited, a conservative description of the trend would be that Asian American IQs compare favorably with that of the American population as a whole. Sowell (1978) speculated that language problems may have influenced earlier observations.

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[1] I am indebted to Abigail Harris, ETS Western Regional Office, for supplying this and other California studies.

Table 2

Asian American median IQ trends over time

	Chinese		Japanese	
Decades	Median IQ	Sample Size	Median IQ	Sample Size
1930s	103	107	*	*
1940s	101	277	*	*
1950s	102	1,015	101	124
1960s	107	765	*	*
1970s	108	105	*	*

*Sample size less than fifty.

Source: Sowell, T. (Ed.), 1978.

Higher education academic aptitude measures: Comprehensive summary data are available for several cohorts of self-reported Orientals/Asian Americans. These were candidates of national testing programs for admissions to colleges and universities in the U.S. and Canada. With the exception of perhaps one or two individually administered intelligence tests, the national programs have accumulated the largest numbers of high quality reliability and validity studies. Reliability and validity coefficients for student populations as a whole fall well within professionally acceptable limits. The question that is raised is whether these tests are reliable and valid for Asian Americans. Some studies are available to address these issues. Rock and Werts (1979) report split half reliabilities of the Scholastic Aptitude Test (SAT). In verbal, mathematics, and Test of Standard Written English (TSWE), factors are generally higher among Oriental candidates than for other populations, as shown in Table 3.

Table 3

Reliabilities of the SAT-V, M, and TSWE

	Factors by Populations					
	American Indians	Blacks	Mexican Americans	Orientals	Puerto Ricans	Whites
Verbal	.9131	.8811	.8950	.9229	.9032	.8947
Mathematical	.9157	.8600	.8971	.9091	.8974	.9047
Test of Standard Written English	.9087	.9018	.8977	.9105	.9148	.8620

Source: Rock, D., & Werts, C., 1979.

Intercorrelations among the three factors for the populations studied showed that mathematics scores of Oriental candidates have lower relationships with the two verbal scores. In other words, mathematics and verbal skills are more differentiated within the Oriental candidates' populations. High mathematical ability is less related therefore to high verbal ability for Orientals than among all other groups, and this phenomenon is considered by the authors to be a true population difference.

A validity study undertaken by Goldman and Hewitt (1976) based on student data from four University of California campuses during the academic year showed that SAT scores and high school grades were more valid predictors of college Grade Point Averages (GPAs) for Oriental and White students than for other minority groups. Using general regression systems, the college GPAs of Oriental and White students were predicted with similar accuracy. There was a very slight tendency towards underprediction of GPAs of Oriental students. Their actual GPAs were slightly higher than predicted. The collective evidence seems to

indicate that SAT scores are at least as valid and reliable for Asian Americans as for the majority population.

Summary data have been released by the College Board for the 1971-72 SAT candidate population. These were high school seniors who were SAT candidates before July, 1972. Table 4 shows comparative SAT-V and M scores of self-reported Orientals and Whites. Orientals averaged lower SAT-V and higher SAT-M scores than Whites. The score distribution shows greater proportion of White students falling into the highest distribution (700-800) range in SAT-V, and greater proportion of Oriental students falling into the highest SAT-M range.

There are parallel data from Asian American candidates' aptitude test scores for graduate and professional studies. Summary statistics by ethnic groups are available for the 1978-79 Graduate Record Examinations verbal, quantitative, and analytical scores as shown in Table 5.

Again, we can observe that the Asian American mean verbal score is about one-third of a standard deviation lower than that of White candidates, and the mean mathematics score about four-tenths of a standard deviation higher. Only U.S. citizens were included in the distribution, but 86% of the Asian Americans reported English as being their "best" language, compared to 98% of White candidates. Thus, bilingualism as a mediating factor cannot be ruled out.

Table 6 shows that accepted Oriental/Asian American medical students in 1975-76 had higher mean scores on MCAT quantitative aptitude and science scales, and lower mean scores in verbal aptitude and general information scales than White students accepted into medical school. Furthermore, the mean undergraduate grade point average of nonaccepted Asian American science majors was higher than that of accepted students from most other minority groups. Competition for admission to medical school was keener among Asian Americans. Only 31.7 percent of the

Table 4

SAT Score Distributions of Self-Reported Oriental and White High School Seniors, 1971-72

Score Distribution		Oriental		White	
		N	%	N	%
SAT-V	700-800	130	1.3	10,119	2.0
	600-690	801	7.9	58,657	11.6
	500-590	2,232	22.1	136,643	27.1
	400-490	3,294	32.6	172,974	34.4
	300-390	2,791	27.6	109,797	21.8
	200-290	850	8.4	15,133	3.0
	Total	10,098	99.9	503,323	99.9
	Mean	442		474	
SAT-M	700-800	601	5.9	22,564	4.5
	600-690	2,001	19.8	86,521	17.2
	500-590	3,190	31.6	158,049	31.4
	400-490	2,788	27.6	151,466	30.1
	300-390	1,309	13.0	74,498	14.9
	200-290	208	2.1	9,892	2.0
	Total	10,097	100	503,290	100.1
	Mean	517		505	

Source: College Entrance Examination Board, 1972.

Table 5

GRE aptitude test scores for self-reported Asian Americans, Whites, and Total candidate population (U.S. citizens only) 1978-1979

GRE Scores		Asian Americans	White	Total
Verbal	N	2,923	161,592	196,404
	$\bar{X}$	480	511	499
	SD	120	111	118
Quantitative	N	2,923	161,592	196,404
	$\bar{X}$	566	525	512
	SD	129	122	130
Analytical	N	2,923	161,592	196,404
	$\bar{X}$	510	529	513
	SD	124	111	121

Source: Wild, C. L., 1980.

Table 6

MCAT scores and UGPAs of Medical School Applicants, by acceptance status and by self-description, 1975-76 first year class

Self-Description	Number with MCATs	Percentage with MCATs	Mean MACT Scores VA	QA	Gen	Sci	Number with GPAs	Percentage with GPAs	Mean UG GPAs BCPM	AO	Total	Total Number	Percentages
White/Caucasian													
Accepted	12,956	37.3	584	628	558	627	12,135	37.5	3.52	3.52	3.52	12,985	37.2
Nonaccepted	21,716	62.6	533	573	523	552	20,168	62.4	3.06	3.21	3.13	21,883	62.7
Total	34,672	83.4	552	594	537	580	32,303	86.3	3.23	3.33	3.28	34,868	82.4
Oriental/Asian American													
Accepted	386	31.8	573	654	53[illegible]	631	365	32.4	3.52	3.52	3.53	387	31.7
Nonaccepted	826	68.1	496	603	481	549	761	67.5	3.13	3.24	3.19	833	68.2
Total	1,212	2.9	520	619	498	575	1,126	3.0	3.26	3.33	3.30	1,220	2.8
Total													
Accepted	15,192	36.5	575	620	550	615	14,059	37.5	3.46	3.48	3.47	15,365	36.3
Nonaccepted	26,337	63.4	522	562	513	539	23,342	62.4	3.02	3.19	3.10	26,938	63.6
Total	41,529	100.0	541	583	527	567	37,401	100.0	3.18	3.30	3.24	42,303	100.0

Legend: VA = verbal aptitude
QA = quantitative aptitude
GEN = general information
SCI = science
BCPM = biology, chemistry, physics major
AO = all other majors

Source: Willingham et al., 1977. Original source: Gordon, 1977.

applicants were accepted compared to 37.2 percent of White candidates. Only Cuban Americans had as much difficulty as Asian Americans in gaining admission to medical school. It must be noted, however, that 2.8% of the first year medical student population was Asian American--a higher than expected proportion relative to the overall proportion of Asian Americans among the general population.

The same trend of superior quantitative performance over verbal aptitude performance was manifested among Oriental (Asian American) males in a recent study of differences in Graduate Management Aptitude Test (GMAT) item types among diverse ethnic and language groups who had applied for admission to graduate schools of management. Among five groups of applicants classified by ethnicity, Oriental men were ranked first in Problem Solving and Data Sufficiency item types, from sections which assess quantitative abilities. They were ranked third among the five groups in Reading Comprehension items and Practical Business Judgment and fourth in Language Usage items (Sinnott, 1980).

Oriental law school applicants as a group did not perform quite as well as White applicants in LSAT during the 1975-76 application year, as shown in Table 7. Yet, a relatively greater proportion of Oriental applicants were accepted into at least one LSDAS-ABA law school. The 64 percent of Oriental candidates, who were admitted, was almost twice the proportion of Asian American MCAT candidates admitted into medical school during the same year. We will see later that there are relatively fewer Asian American lawyers than expected in the total U.S. population. With the greater than majority acceptance rates, that imbalance may begin to be corrected.

Organization of Mental Abilities Among Asian Americans

Intelligence and academic aptitude test performance of Asian Americans reviewed above consistently indicate higher average scores in mathematics, and lower scores in verbal sections than the U.S.

Table 7

Number and percentage of candidates at or above select LSAT score levels and percentage who received at least one offer of admission to a LSDAS-ABA Law School 1975-76

Group:	Oriental[2]			White & Unidentified		
SCORE:	N	%	% accepted	N	%	% accepted
LSAT ≥ 600	206	25	84	24,468	37	85
LSAT ≥ 500	520	63	78	51,307	77	77
LSAT ≥ 450	647	78	75	59,359	89	65
TOTAL	829	100	64	66,994	100	59

Source: Evans, F. R., 1977.

[2] I am indebted to Mr. Franklin R. Evans of LSAS for subgroup details of his 1977 study.

population as a whole. Figure 1 demonstrates the profiles of factor means for SAT verbal and mathematical item types. There is more than three-fourths of a standard deviation difference, average verbal and mathematical abilities of Asians are compared. Is there evidence of further differentiation of cognitive structure among Asian Americans? There are recent survey data for several Asian American groups, from first grade to high school, which together provide a reasonably consistent picture of profiles of mental abilities. Ethnicity, apparently, has a primary impact upon the organization of mental abilities, which is not modified by socioeconomic influences. Social class, however, does influence the level of performance, with more advantaged subjects typically attaining higher scores. Construct validity for primary mental ability among Chinese students was reported by Vandenberg (1959) using factor analysis on data from 35 tests in English and Chinese.

Patterns of ability among young children: Lesser et al. (1965), Stodolsky & Lesser (1967) conducted and then replicated an investigation of patterns of ability among different ethnic groups. In New York, (Chinese, Jewish, Negro, and Puerto Rican) and later in Boston, (Chinese, Irish, and Negro) middle and lower class first graders were assessed. Individually administered measures of verbal, numerical, rational, and spacial conceptualization were given in the child's mother tongue, or in combination with English if the child was bilingual. Reliabilities for the scales were generally in the .90s. Of the five ethnic groups studied at two sites, Chinese children outperformed all other groups in reasoning and space scales, and were about par with Jewish children who scored high overall on numbers scales. Chinese children were below all groups except Puerto Rican children in verbal performance. Figure 2 shows Chinese middle and lower class performance at two sites relative to all ethnic groups combined in New York. Since the tasks were administered in their home dialects, it was not the lack of English that affected verbal performance. Bilingualism per se, however, cannot be ruled out as a mediating factor, since Chinese and

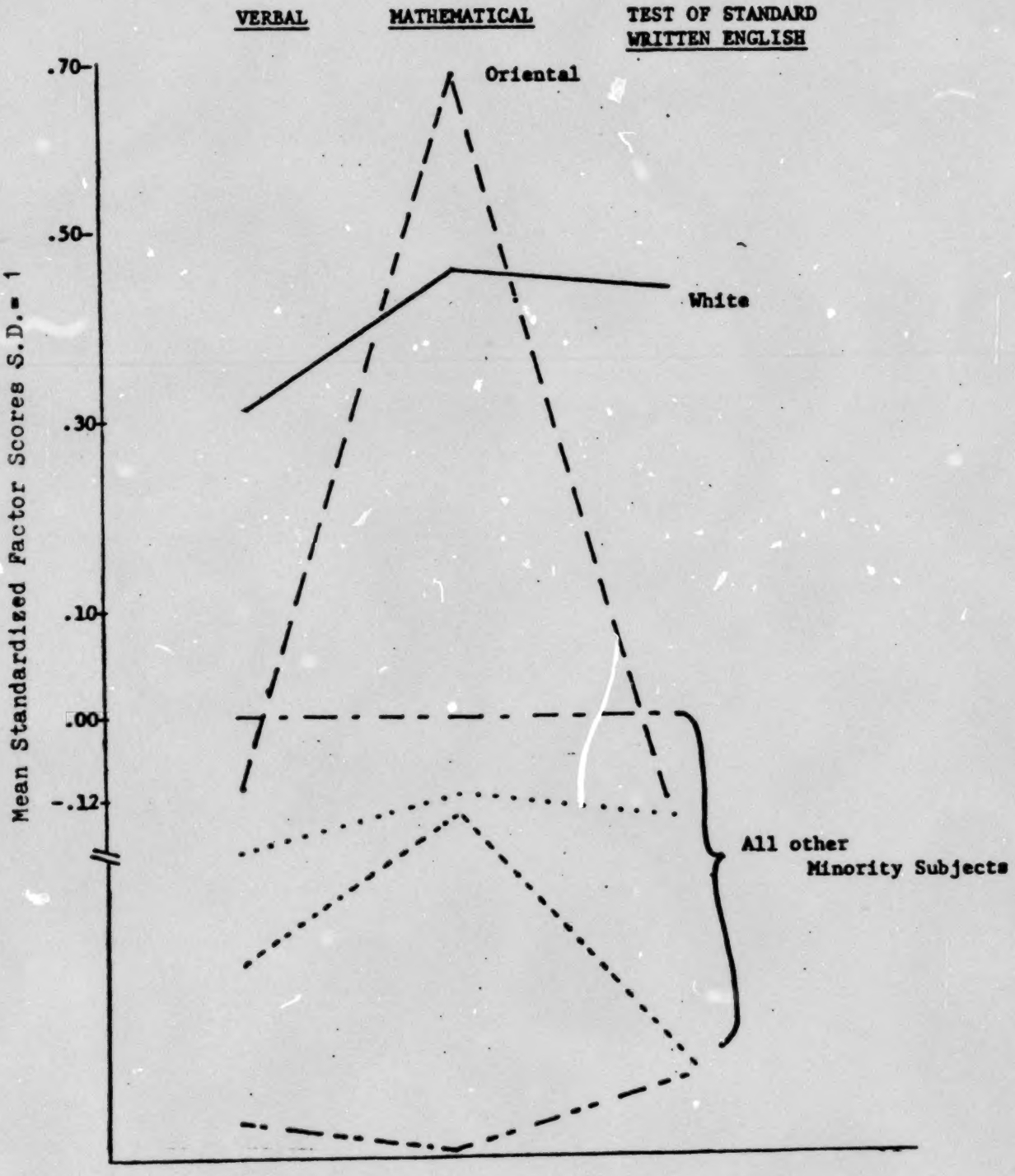

Figure 1: Scholastic Aptitude Test: Total Factor Mean Profiles

Source: Rock, D., & Werts, C., 1979.

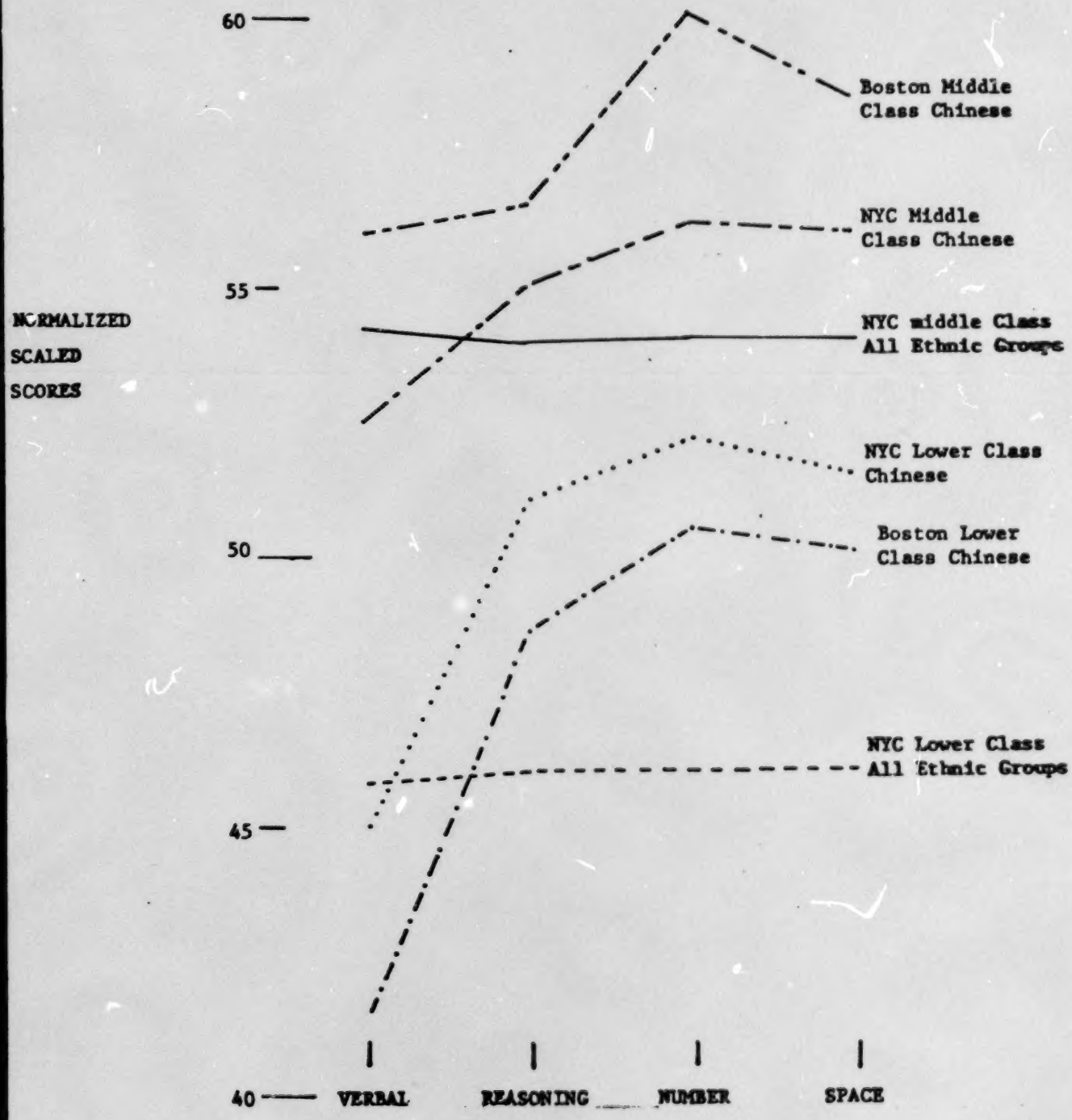

Figure 2. Patterns of Mental Ability of First Grade Children: N.Y.C. and Boston Chinese and All N.Y.C. Ethnic Groups Classified As Middle and Lower Class

Source: Lesser, G., 1965; Stodolsky, S., 1967

Puerto Rican children received lower mean verbal scores than other groups.

Among the five ethnic groups studied, the Chinese contributed most to the distinctiveness of ethnic group patterning. Thirty-nine percent of the total variance of the groups by tests interaction term was contributed by Chinese subjects.

Difference in patterns of mental abilities has also been observed and reported between selected groups of Filipino and Canadian students in grades 6 and 8 (Flores, 1972). The subjects were Filipino children in Manila, and Canadian children from Oshawa, Ontario. No generalizations can be made about cultural influences, since the samples were not random, but educational level was controlled. The Filipino children were in a selective school which provided instruction in English from kindergarten onwards. While these children were not Filipino Americans, they were able to take the battery of 18 tests in English. Caution must be exercised in interpreting the results, because of the language handicap and because the subjects were not Americans. Nevertheless, profiles of test performance were distinctive for Canadian and Filipino children, and levels of performance increased with schooling. Further analysis yielded two uncorrelated second order factors. These factors were named Relational Thinking (R) and Associative Learning (A). Canadian pupils were superior in tests which were more heavily loaded with R, while Filipino students did better on tests loaded with A factor.

Patterns of mental ability in high schools: During the 1967 school year, a battery of nine tests was administered to 18,000 high school juniors in three cities in connection with Project ACCESS. ACCESS was sponsored by the College Board to improve access to higher education for minority/disadvantaged students. The Los Angeles sample contained more than 400 subjects who identified themselves as Oriental. Factorial structure was shown to be similar among the four ethnic groups studied

(Flaugher & Rock, 1972). That is, the tests seemed to be measuring the same traits among all groups, and were considered to be valid across groups. Figure 3 shows the patterns of Oriental and White subjects. Once more, with the exception of verbal aptitude scores, Oriental subjects typically scored higher than White subjects on aptitude measures, particularly on reasoning and numbers scales. The authors cautioned that background questionnaire data showed Oriental students to have been of higher SES level than White students in the same schools. We must therefore interpret the findings conservatively, and discount the absolute level of mean scores. At the same time, SES differences have been shown in other studies not to alter the pattern or profile of mental abilities. We can see these Los Angeles high school patterns showed common peaks and valleys when compared with the Chinese first graders' behavior in Boston and New York (Flaugher & Rock, 1971).

Project TALENT is yet another large scale survey that reveals significant information on Oriental subjects. In this study a representative sample consisting of 4.5% of U.S. high school students in 1960 were surveyed. A reanalysis and a five year follow-up of the TALENT sample of grade 12 students classified by ethnicity and sex were undertaken to examine patterns of abilities (Backman, 1972). Sex was found to have been an even more decisive factor than ethnicity in shaping patterns of mental ability among high school seniors. Sex accounted for 69% of the total variance, while ethnicity accounted for 13%. Of the variance associated with ethnicity, 9% was associated with pattern and 4% with level of abilities. Oriental seniors were differentiated from other groups by high mean score on MAT (mathematics). Other mental ability factors were not significantly different from the total group. Average standard score levels of ability was 52.0 for Orientals, close to the Jewish-White mean at 51.9 and non-Jewish-Whites at 51.2. The author discussed the observed differences between these data and those of the Lesser study, where sex was not an important influence on performance. The overriding influence of sex on patterns of mental abilities for high school seniors was

interpreted to be cumulative with age and associated with schooling. A meta-analysis of the Coleman Study data using a new technique--commonality analysis, on the other hand, did not report a strong influence by sex on academic achievement. Social class, attitudinal, and motivational factors were most important (Mayeske, 1975).

Cognitive Style Among Asian Americans

Another cognitive dimension, aside from aptitude and structure of intellect, is cognitive style of individuals. Cognitive styles refer to a model of psychological differentiation which classifies patterns of psychological behavior into field dependent and independent styles (Witkin & Goodenough, 1976). The styles are conceptualized as tendencies to rely upon internal or external cues in information processing, originating from differences in the extent of self-nonself segregati[illegible] Field independent people do well in cognitive analysis and restructuring tasks, while field dependent people have greater social sensitivity and stronger social skills. Some individuals are relatively fixed in their use of one style, while others have access to both cognitive styles in their behavior repertory.

In school, field independent students favor impersonal domains that require restructing skills, such as science and mathematics. Field dependent students prefer interpersonal domains such as elementary and early childhood education (Witkin et al., 1976). Cognitive styles also provide information for adapting instruction to styles of learning. Students who prefer academic self-determination through student centered instruction typically major in behavioral sciences, arts, and humanities; while students who are instructor centered tend to major in business, technology, and physical and health sciences (Warren, 1975).

As for the relationship of cognitive styles to career choices, there is evidence that premedical students who are field independent

stand a better chance of getting into medical school than field dependents, given similar academic aptitudes. Once in a medical profession, specialty choices seem associated with cognitive style as well. Psychiatrists and psychiatric nurses are relatively more field dependent, while surgeons, radiologists, and surgical nurses are more field independent (Goodenough, 1977; Witkin & Cox, 1975).

What information have we about the cognitive styles preferred by Asian Americans? Making inferences from aptitude and performance test scores and from field career choices, we might hypothesize that the typical Asian American would lean towards field independence. Unfortunately, few empirical studies are available. A thorough search of definitive bibliographical references on cognitive styles yielded a single unpublished study involving Asian Americans (DeAvila & Duncan, in press). This apparent information void has been confirmed by Hsi (1977).

There have been a few studies conducted on Asians in Hong Kong, Korea, and India. These generally compared cognitive style differences among age cohorts or between urban and rural subjects. It is unwise to make a leap of logic from Hong Kong boat children, or Korean farmers to the Asian American population. However, a few references will be cited. Susceptibility to visual illusions is a developemental trend observed among many populations. In Hong Kong, Dawson (1973) and his colleagues tested illusion susceptibility among several age groups and also reported correlation with cognitive style measures for male sixth graders. At every age, the Hong Kong population was less susceptible to illusions than the Evanston, Illinois population. Since these scores are inversely related to field independence, that is, low susceptibility is related to high field independence; there is some evidence that Hong Kong boys are more field independent than their counterparts in Evanston. Another study of three-dimensional perception among Hong Kong children found them to be midway between Eskimos and South African Whites. Eskimos are well studied and have consistently manifested a

field independent cognitive style. While South African Whites may be different from American Whites, the study at least suggests that Hong Kong Chinese may be more field independent than some White populations (Dawson, 1974).

In a study of a small group of Asian Americans, in Oakland, California, the Children's Embedded Figure Test was used on Chinese elementary pupils. Their mean score proved to be significantly above the norm, thus indicating their tendency toward field independence (DeAvila & Duncan, in press).

Higher Education and Career Paths of Asian Americans

Evidence has been presented about the level and organization of cognitive abilities among Asian Americans. We can be reasonably certain that Asian Americans, if not hampered by inadequate grasp of the English language, do at least as well as other Americans in general on tests of intelligence and academic aptitude. Furthermore, there is consistent and reasonably reliable and valid support for a special configuration in the organization of mental abilities among Asian Americans. The typical Asian American, compared to all Americans of similar socioeconomic level, shows a slight deficit in verbal aptitude, combined with strength in mathematics, reasoning, and space conceptualization abilities. College applicants tend to rate themselves low in spoken expression, but high in art, creative writing, science and mathematics, mechanics, and organizing themselves for work.

What about the performance of Asian Americans in institutions of higher education and beyond? Do they, as a group, capitalize upon their strengths and minimize their weaknesses as they make educational and career decisions? Comprehensive empirical evidence is lacking, but there are bits of information from diverse sources that would indicate that Asian Americans have been opportunistic in using a mini-max decision strategy for planning their lives.

Asian Americans have been assiduous in using education as a vehicle for social mobility. The success of Asian Americans getting into and staying in school is exemplified by recent statistics from the University of California. Only the top 12.5% of high school graduates are eligible to attent U.C. campuses. The percent of each group who qualify are: Anglos, 16.5%; Hispanics, 4.7%; Blacks, 5%; and Asians, 39% (Walsh, 1980).

In the course of a century, Asian Americans have transformed themselves, from a despised and disenfranchised group of sojourners, into what can be acknowledged as the least disadvantaged of the American minorities. According to the 1970 census, Asian Americans, who constituted less than one percent of the total population, reported greater individual and family income and higher educational attainment than the U.S. population as a whole. Substantially higher proportions of Chinese, Japanese, and Filipino Americans were classified as professional and technical workers than those from the total population. Asian Americans (Chinese and Filipinos) also reported a greater than average proportion of service workers. This bimodal (peaks at both ends of occupational scale) phenomenon is probably attributable to the educational and vocational opportunities between second and third generation Asian Americans, and those of the older and the newest immigrants.

Not only are Asian Americans proportionately overrepresented in higher education institutions, they also choose academic fields that require aptitudes for mathematics, spacial conceptualization, and reasoning. Table 8 shows that in relation to White students, almost twice the proportion of Asian Americans chose physical sciences in undergraduate and graduate major fields, and the proportion in biological sciences is also greater. Asian Americans are underrepresented, however, in humanities and social sciences which demand verbal facility, in comparison with White students and the student population as a whole. In reporting academic interests for

Table 8

1978-79 GRE Test Takers Classified by Ethnic Group and Undergraduate and Graduate Majors

Self-Reported Ethnic Group	Asian American	White	Total
N	2,923	161,592	196,404
% in undergraduate major	%	%	%
Humanities	12.64	17.15	16.94
Social Sciences	33.36	45.14	45.96
Biological Sciences	26.52	21.75	21.33
Physical Sciences	24.39	12.66	12.44
Others & Undecided	3.08	3.30	3.33
% in graduate major			
Humanities	9.53	12.38	12.08
Social Sciences	34.86	45.58	46.27
Biological Sciences	24.84	19.73	19.46
Physical Sciences	20.11	10.20	9.98
Others & Undecided	10.65	12.11	12.20

Source: Wild, C. L., 1980.

admissions assessment programs, Asian Americans consistently report most interest in engineering and health sciences, least interest in education and social sciences.

The National Science Foundation (1976) reported that for every 10,000 persons of Oriental descent, 134 were engineers and 89 scientists. In the White population, there were 46 engineers and 27 scientists for every 10,000 persons. Oriental engineers as a group were younger and better educated than White engineers. Forty-five percent of Oriental engineers held graduate degrees, compared to 21 percent of White engineers. Over 70 percent of Oriental scientists held graduate degrees, compared to 52 percent of White scientists. It must be noted, however, that the category Oriental included Asians as well as Asian Americans so that the proportions may be inflated.

In addition to scientists and engineers, the profile of mental abilities of Asian Americans would suggest that other careers fields could also be particularly suited to their strengths. There could also be areas that would perhaps not be suited to a group that seems less capable in verbal tasks. Weyl (cited in Jensen, 1976) examined the professions chosen by various American minority groups based on the 1960 U.S. Census. He calculated an index, which consisted of the number of the total population of a particular ethnic group in a profession to the statistical expected number if all ethnic groups selected professions in proportion to their own numbers. An index number of 100 means the ethnic group is represented in a particular profession in accordance with statistical expectation. An index significantly over or under 100 means that the ethnic group is respectively over or underrepresented in a profession. Table 9 shows that Chinese Americans are vastly overrepresented among accountants, architects, college professors, school teachers, engineers, natural scientists, physicians, and technicians. Japanese Americans were overrepresented among accountants, architects, artists and writers, natural scientists and physicians, and technicians. The two groups were underrepresented among clergymen,

Table 9

Index Number of the Contributions of Chinese, Japanese, and Whites to American Professions in 1960*

Professions	White	Chinese	Japanese
Accountants[1]	112	174	166
Architects[2]	110	506	232
Artists[2] and Writers	110	136	209
College Professors[3]	107	537	143
School Teachers	103	318	86
Engineers[1]	111	303	124
Natural Scientists[1,3]	109	438	205
Lawyers & Judges[4]	111	53	54
Clergymen[4]	104	23	89
Physicians[1,3]	108	302	182
Nurses	106	76	116
Technicians[1]	107	197	201

Index = 100: ethnic group represented according to statistical

> 100: ethnic group overrepresented

< 100: ethnic group underpresented

[1] Profession requires mathematical aptitude

[2] Profession requires spatial aptitude

[3] Profession requires academic aptitude

[4] Profession requires verbal aptitude

Source: Jensen, A. R., 1973 Original Source: Weyl, 1969.

lawyers, and judges, who would be expected to be particularly strong in public speaking, verbal fluency, and social sensitivity.

Being overrepresented in a profession does not guarantee success within that profession. There is evidence that college and university faculty of Oriental descent may suffer significant discrimination in the marketplace. Oriental academicians publish more professional articles but are paid less than White academicians, even within similar higher education institutions (Freeman, 1978). Engineers are another Asian American group who might be distinguished more on account of numbers and solid steady progress, rather than by conspicuously meteoric career paths. Asian American engineers can be found in every subspecialty field. Among the most successful are those who choose to enter high technology fields such as electronics, aeronautics, petroleum, and chemistry. Civil engineer-entrepreneurs, who obtain large contracts in the public sector, are rare. Wei has attributed this phenomenon to the fact that highway and public building contracts are awarded on the basis of political connections and social skills (Sung, 1975). The fast track for engineers in large U.S. corporations usually means switching early into management, rather than staying in pure engineering work. Asian Americans have not been aggressive in changing from engineering into management, according to Professor Wei. Here again, we might speculate that a field independent cognitive style adhered to in every situation, would work against success in management. While ability to restructure information is important, social skills, and social sensitivity, characteristic of field dependent individuals, is also crucial.

Conclusions and Recommendations

We have reviewed the performance by groups of Asian Americans on a variety of cognitive tasks and found some evidence that widely used standardized individual and group assessment instruments have provided valid, consistent, and educationally useful information about the mental functions of Asian Americans from preschool through graduate studies.

We have also reviewed studies that suggest future directions for seeking ways to properly assess academic potential and evaluate past achievements of bilingual and limited English pupils.

Instruments, analyses, and interpretation: Individual and group assessment: Among preschool and primary children, well known standardized aptitude and achievement measures, individually and group administered, have demonstrated utility. While past academic records are usually the best predictors of future academic performance, refugees and other recent immigrants may not have such records. For persons with limited knowledge of English, and lack of familiarity with testing situations, individual tests administered by professionals fluent in the examinee's home language are most likely to yield an accurate assessment of cognitive functioning. Performance subtests, nonverbal instruments and numeracy tests needing a minimum of verbal skills are apt to reflect limited English proficiency students' academic status more faithfully than verbal tests.

For students in upper grades, middle, and secondary schools, quantitative assessment instruments requiring a minimum of English, or separate scoring of computational and word problems would be most useful for assessing mathematics achievement status. Furthermore, a substantial difference in relative performance on verbal and mathematics sections of a battery would not necessarily reflect limited English, but instead may be a manifestation of typical mental profile associated with Asian Americans. Additional information on English and native language proficiency--listening, speaking, reading, and writing--would be needed before counselors and curriculum specialists can make informed judgments about placing and prescribing educational programs for limited English proficiency Asian Americans.

Policy studies and program assessment: Instrument choice, analysis, and interpretation of data about Asian Americans and Pacific Islanders for the purposes of program evaluation and policy decisions

serve different purposes than those of individual assessment. Often, statewide or national assessment programs stress basic skills, while district-wide assessment programs might be a reanalysis of basic skills data, or a standardized norms-referenced battery, or locally or nationally developed criterion-referenced instruments.

The analyses of Asian Americans' and Pacific Islanders' data usually lump them all into one category and obtain distributions, means, and variances for the entire group. Sometimes, this strategy is adopted because numbers do not permit finer classifications. Where numbers do not present a problem, however, we have seen that more can be teased out of aggregate data when Asian Americans are grouped not only by specific combinations of bilingualism, but by degrees of proficiency in English as well. The main point for separate groupings even for mathematics data is the expectation that the Asian Americans population is not homogenous, but multiethnic and multicultural. Furthermore, we might expect a bimodal distribution of scores according to English proficiency for any one bilingual grade or age cohort. The distribution for the fluent in English bilinguals would be systematically different from the distribution of the limited English fluent bilinguals. Even mathematics tests require some reading capability. Also, separate analyses for Asian American groups and Pacific Island groups may be helpful, as there may be motivational and affective differences among groups (Okura, 1979).

Intragroup and intergroup variations: Our present focus on commonalities in mental structure and specific aptitudes among Asian Americans must not obscure a fundamental psychometric tenet--differences within a group are invariably greater than differences among groups. The diversity of skills, talents, interests, and knowledge among Asian Americans is enormous, as in any basically heterogeneous, but demographically convenient ethnic grouping in America. As educators, we

are obliged to identify and foster maximally every single individual's cognitive development while recognizing common themes among them.

We can acknowledge and make educational provisions for the majority of Asian Americans who seem more interested in and excel in mathematics, reasoning and three-dimensional spatial concepts. But we must not neglect the potential Richard E. Kims, Maxine Hong Kingstons and Ved Mehtas of the twenty-first century by failing to make parallel provisions for individuals who show an interest in and a talent for speaking and writing. Educational decisions about individuals need to be done on a case-by-case basis, with educational measurement as a useful tool for making informed judgments.

Recommendations for future research: Cognitive assessment of Asian Americans, and especially of bilingual children, offers opportunities for fruitful basic and applied research in a number of areas that have hardly been touched. Potentially interesting investigations include replications of the DeAvila and Duncan findings on cognitive style of Chinese-American children, and initiation of cognitive style research among other groups of Asian Americans and Pacific Islanders. These can, in their turn, lead to planned variations studies on instructional styles most effective with diverse cognitive styles found among Asian American and Pacific Island groups.

Another research area warranting further investigation is related to second language acquisition among groups of bilingual Asian Americans. Variables that would be expected to influence school achievement and English acquisition could include socioeconomic status indicators, home language, levels of skill in first language, opportunities for practicing English in and outside the school, methods of instruction used to teach English and attitudinal and motivational factors. How these factors, separately and in combinations, influence English acquisition and school performance is certainly worth looking into.

Successful instructional approaches to English instruction is another area that deserves more attention. If, for example, field independence and relatively poor rote memory, in combination with average or above average intelligence, is indeed typical of specific Asian American groups; one might postulate that instructor-centered methods, and teaching of linguistic rule-making and learning-to-learn strategies migh be more successful than routine English drills. Other Asian American groups who seem to prefer accomplishing learning tasks in groups, on the other hand, might enjoy and learn best in group situations rather than by individual recitations. Each of these notions would be amenable to hypothesis testing through planned variations studies, with naturally existing comparison groups in classroom settings.

Potential for useful research is hardly limited to those few suggestions. There are many educational issues that might be clarified through well designed cross-cultural studies. Finally, we must remind ourselves that studies in educational settings cannot neglect motivational, attitudinal, and personality factors which have very substantial influences upon educational results. Our multicultural, multiethnic heritage deserves to be painted with as broad and complex a palette as our limited knowledge allows.

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